SCIENCE.

FRIDAY, MARCH 5, 1886.

COMMENT AND CRITICISM.

IT SEEMS PROBABLE that in the latter part of April, and first part of May, we are to have the unusual spectacle of two fine comets visible at the same time. We have already mentioned the increasing brightness of Barnard's comet, and we now learn, from Dr. Oppenheim's study of the comet discovered by Fabry at the Paris observatory on Dec. 1, that this comet will greatly surpass Barnard's in brilliancy. It will be seen in the north, and its position will be very similar to that of the brilliant comet of 1881. For a short time it will not set at all in our latitude, but will remain visible throughout the night. The comet is now visible in a moderate-sized telescope, and is increasing slowly in brightness. About April 1 the increase will become more rapid, and by the middle or latter part of that month it will undoubtedly become visible to the naked eye. Its maximum brightness, over six hundred times as bright as when it was discovered, will be reached about the first of May, when it will be situated in the sky, not far from Barnard's comet; and by the end of May it will have passed south of the equator, becoming again a telescopic object. Another favorable circumstance is noted in the fact, that, when the comet is at its brightest, there will be no moon to detract from its splendor. Dr. Weiss points out the possibility that on the 26th or 27th of April the comet may be between us and the sun, and may consequently be projected on the sun's disk.

THE ANNUAL REPORT of the managers and superintendent of the reformatory at Elmira to the New York legislature is not a very large document, but every page of it is of the greatest interest. It is the record of the progress of an attempt, not merely to confine and punish criminals, but to reform them, and to make good and useful citizens out of a class of men usually given over altogether by society as dangerous. It will be remembered that this institution was founded in 1870; and it was then enacted, that, at the discretion of the court, any male criminal between the ages of sixteen and thirty, who had not previously been sentenced to a state prison in this or any other country, might be sent to it; and by the provisions of the act the managers were made a reforming and not a merely punishing body. No criminal was to be confined for a longer period than the legal term of the sentence for the crime of which he was convicted; but he might be released at any time after six months' confinement, if, in the judgment of the managers of the institution, he was sufficiently reformed to be trusted with his freedom. How well Mr. Z. R. Brockway, the superintendent, has succeeded in his task of reformation, is well known to students of our penal institutions, and the many problems connected with them. But we believe that the general public will hardly be prepared to hear the facts and figures adduced in the present report.

Mr. Brockway believes that the common incentives to crime are ignorance, improvidence, and indigence; and he undertakes to employ the time during which the prisoners are confined, in endeavoring to remove and guard against these incentives. To ignorance he opposes education; to improvidence and indigence, voluntary earning and saving; and he calls these "indispensable elements in any rational, effective, reformative system of prison management." The details of the scheme of instruction, as given in this report, are marvellous, especially those concerning the English literature class, which is a new feature, and one called into being in order to fill in the gap between the hours of compulsory labor and compulsory study, — a period "in which inmates returning to their accustomed thoughts often return, at the same time, to their former selves; so that much labor was lost, and injury derived." Imagine five hundred felons intently poring over 'Hamlet,' the 'Canterbury tales,' 'Rasselas,' Bacon's 'Essays,' Browning's 'Rabbi ben Ezra,' — names selected at random from a long list of works studied! This sounds very fanciful; but, as a matter of fact, the results are very practical. The reformatory keeps accurate statistics regarding its inmates; and, of the 2,061 prisoners handled under the act of 1877, the state has protection against 1,878, or 91.1 per cent; and it is

unprotected against only 183, or 8.9 per cent. Of the former number, 658 are still in custody at the reformatory, 109 were released and sent out of the state, 11 were absolutely released as satisfactory without any parole, and 735 were released after parole.

Mr. Brockway, in another set of tables, estimates that 81.2 per cent of the whole number paroled are reformed, and that only 16.3 per cent returned to criminal practices or contact. This is a wonderful showing, and betokens a departure in prison theory and practice that should before long become general. Under this system the state does not lock its offenders up for a certain time, and then take its chances with them; but it employs the months of confinement in guarding itself against the future. On the consequent advantages to the criminal and to society, not a word need be wasted. An interesting and valuable appendix to the present report is a series of charts, prepared by Mr. Brockway, to show graphically the fluctuations in the course and progress toward release, of one thousand prisoners under the reformatory system. They show some curious cases of what may be called 'reversals to type,' and are valuable as psychological and ethical studies. The average population of the institution in 1885 was 647; the average period of detention of the present inmates was 16.9 months; and the average detention before parole, and of the whole number paroled to date, was 20.7 months.

The committee of the national academy, to which was referred the question of a new naval observatory, as mentioned in our last week's issue, was called upon by the secretary of the navy for an opinion on two other questions of considerable interest to astronomers: viz., the expediency of making the change in the beginning of the astronomical day from midnight to noon, as recommended by the meridian conference; and as to the advisability of asking congress to make an appropriation for the observation of the total solar eclipse of Aug. 28-29. In regard to the astronomical day, the committee recommends that the change should be made as soon as sufficient concert of action can be secured among the leading astronomers and astronomical establishments of the civilized world, — 'in 1890 if possible; if not, in 1900.' This conclusion is reached, in view of the general consensus of the astronomers of this country in favor of the change, and the adhesion to the same view of so important an institution as the Royal observatory of England.

In regard to the observation of the eclipse, the committee is not in favor of calling upon congress for an appropriation, on the ground, mainly, that there would not probably be sufficient time to make such preparation of instruments and observers as to insure results commensurate with the magnitude of the undertaking. The report says, "In addition to the observation of the sun itself, and the luminous phenomena attending it, it is desirable to obtain photographic maps of all the surrounding region, to the distance of at least ten or fifteen degrees from the sun, for the purpose of finally setting at rest the still mooted question of an intra-mercurial planet. It is true that the astronomical world is at present disposed generally to discredit the existence of such a body; yet the evidence on the subject, up to this time, is mainly negative, as it must always continue to be, so long as it depends upon direct vision. In a photographic map taken during total eclipse of the sun, of the whole region within which such a planet must necessarily be confined, the object, if present, must present itself, and could not fail to be recognized."

Railway companies have become so important a part of our industrial organization, and the power they wield is so great, that the right adjustment of their relations to individuals and to the public at large is imperatively necessary. Troubles are constantly arising between the companies themselves, between the companies and shippers, and between the companies and their employees, leading oftentimes to a great disturbance of the national industry. A railroad 'war' is raging at this very moment among the transcontinental lines at the west; and it is only a short time since a dispute between corporations and their workmen almost paralyzed the business of Galveston. How such disputes can best be settled, — whether by state regulation, by arbitration, or by leaving the evil to work its own cure, — is the question before us deserving notice. We would call attention to a certain distinction which prevails in the matter, and which is liable to be insufficiently attended to. The state may interfere with the making and execution of contracts for either of two purposes, — for the sake of the contracting parties or of one of them, or

for the sake of third parties or of the general public. A contract between two parties may have an important effect on the rights and interests of persons who are noway concerned with the making of it, and in such cases it has long been the custom for the state to interfere for the protection of those persons. Such cases often arise in relation to common carriers. For instance: if a railway company charges one shipper a higher price for carrying freight than it charges another for the very same service, it does injustice to the party against whom the discrimination is made; hence recent decisions of the federal courts have declared such discrimination to be unlawful.

THE MEETING of the American economic association, held on Saturday last in this city, indicated that the interests of the association are being wisely provided for, and that the plans under preparation are in the interest of true science. It showed itself cautious, and gave no countenance to the establishment of a newer creed with fresh dogmatic utterances. In the deliberations the prominent fact stood out that the purpose of the society must be in method. Scientific method of investigation is the great need of economics at the present time, and it is to this department of work that this new association can unfalteringly commit itself. The patient collection and analysis of facts is a necessity which requires no apology in these days of confusing arguments drawn from insufficient statistical and social data. The council, however, assembled for practical work, and took a step forward in the development of the usefulness of the society by admitting the Connecticut valley economic association into its membership. This force, of about seventy-five members, is located chiefly at Springfield, Mass., and is a local society recently founded, and modelled after the constitution of the larger association. It was also determined to publish at an early date one or two monographs, as well as the secretary's report, which will shortly be in print.

GEOGRAPHY-TEACHING IN GERMANY.

IN the matter of geographical education, Germany may be taken as the model which other European countries are following, so far as their special circumstances will permit. It is true that teachers like Dr. Lehman and Professor Wagner are not satisfied with the position yet attained in German schools. But to the eyes of Mr. Keltie, accustomed as they were to the methods and appliances of English schools, Germany seemed very far ahead. He therefore devoted a considerable portion of his 'report,' recently published by the Royal geographical society, to a description of what we may call the German system of geographical education. According to him, the ideal aimed at, and indeed being rapidly carried out, is to have one continuous course of geographical instruction from the first year in the primary school up to the university.

The preliminary stage, or what is known in Germany as *heimatskunde*, combined with or preceded by actual observation, is met with in nearly all the primary schools and in the preparatory classes of the higher schools. There are no textbooks in this early stage, except for the teacher, the pupil obtaining his ideas from actual observation or practice. The instruction begins with the student's home surroundings, and proceeds outwards from the town to the district, then to the province, Germany, Europe, and, finally, the world in general. At the outset the pupils are given a mastery of the cardinal points, the course of the sun in the heavens, and similar elementary notions. This is done, not by compelling him to commit the compass-card to memory, but by getting him to find the direction of his own house from the schoolroom, and by encouraging him to apply a few simple ideas in his daily walks and games. The next step is to teach him how to read a map. Here, again, his local knowledge is utilized. A map of his own town is procured, and he learns how to trace his own homeward path, and to find out the direction of some well-known buildings. Then he often visits, map in hand, the surrounding country, and thus learns the actual meaning of this or that geographical symbol. Often these excursions are extended to distant points of interest. Many teachers think that students acquire this faculty of map-reading best by learning how to use the geographical symbols themselves, or, in other words, by practice in map-drawing; but, wherever this method is followed, it is insisted on that the drawing is done, not to produce a work of art, but solely to familiarize the pupil with contour lines, mountain-shading, and other similar signs. In some schools the pupils build up the relief of a country with sand; in others the contour lines are reproduced in card-board, and the relief is built up with great exactness. When the maps are well made, as most modern German maps are, no better way to teach the meaning of geographical symbols could be devised. But the conditions must be favorable; and, above all, maps with unusual symbols, such

as water-partings indicated by black lines, should never be used in the schoolroom.

The young German does not leave his geography behind when he leaves the primary school. Far from it, as, in the gymnasia and *realschulen*, geography is taught for two hours a week throughout the whole course, except that, in some gymnasia (classical schools), the last two years are devoted to other subjects. What is actually taught may be gathered from the following summary of the programme of the *realschule* of the first order at Leipzig: —

Sexta (lowest class). — Leading principles of physical geography, general view of the earth, geography of Saxony, exercises in map reading and drawing.
Quinta. — Advanced instruction in the above branches, Germany taking the place of Saxony as the special subject.
Quarta. — Revision of the work of the two previous years, extra-European continents.
Tertia. — Germany, both physical and political, map-drawing.
Unter secunda. — Foreign European countries and their colonies.
Ober secunda. — Extra European continents, especially as to their physical conditions.
Unter prima. — Astronomical geography.
Ober prima. — Revision of the whole field, astronomical geography.

As to methods, Mr. Keltie was impressed by the fact that the teaching of geography was a much more lively operation on the continent than in England. In Germany the teacher counts for a great deal; the text-book, for very little. There is almost no lesson-hearing; the text-book, when used, simply furnishing a text for the teacher's explanations. No attempt is made to crowd the lessons with minute details—no long lists of names; no tables of statistics, of population of cities, lengths of rivers, or heights of mountains. The memorizing is confined to the leading principles, facts, and features. In fine, when a German boy leaves the higher school for business or the university, he carries with him a sound working knowledge of geography.

Of course, there could not be such good teaching without good teachers; and it is a fact to be noted, that, at the present moment, the leading universities of Germany set out to train teachers of geography exactly as they do teachers of history, archeology, or botany. A dozen years ago this was not so, as nearly all the twelve professorships of geography have been founded since 1873. Now, however, geography is on an equal footing with other branches in more than half of the German universities. At Goettingen, for example, a man may take his doctorate, with geography as his special subject. Then, too, there are examinations for the right of teaching (*facultas docendi*) geography in the higher schools. These examinations are of two degrees or stages: 1°, for the right to teach in the lower classes; and, 2°, for the right to give instruction to the highest classes. The course for this last examination extends over two years. The candidate must attend a systematic series of lectures on the facts and principles of geography. At the *übungen*, or exercises for advanced students, practice in the best methods of teaching is afforded. Special investigations are encouraged by some professors, as, for instance, by Rein at Bonn, and Richthofen at Leipzig. Mr. Keltie 'assisted' at one of these practice-courses, and was evidently surprised at the excellence of the work presented. There is no doubt, that, as the supply of well-trained teachers becomes more ample, the teaching of geography will be still further improved. What has already been accomplished is well set forth in the following sentence from the recent 'memorial' of the Royal geographical society: —

"An impartial comparison of the literary results of English and German travel at the present day seems to show that the educational advantages which we ask for in England, and which are attainable in Germany, have there borne their actual fruit in developing and directing the powers of observation in German travellers."

METEOROLOGICAL CONFERENCE.

On invitation of the chief signal officer, U. S. army, representatives of a number of the state weather services met in Washington on Feb. 23 and 24, to consider the relation of state services to the signal service, matters of observation, display of local weather-signals, and related topics. The meeting was opened by General Hazen, chief signal officer. Prof. T. C. Mendenhall of the signal office was then chosen chairman, and Prof. W. M. Davis was appointed secretary. Four sessions were held in the lecture-room of the national museum, and the following action was taken.

The conference recommends that the volunteer observers of the state weather services should make their regular thermometric observations at 7 A.M., 2 and 9 P.M. When maximum and minimum thermometers are used, they should be read at the latest hour of observation in the day, preferably at 9 P.M. Observers of rainfall are advised to use the new form of rain-gauge adopted by the signal service, or to follow this pattern as nearly as possible. The gauge should, when practicable, be placed with the collecting-edge one foot above the ground, and should stand at least twice as far from adjacent objects, such as trees, buildings, fences, etc., as the height of these objects. The conference disapproves of placing rain-gauges on the roofs of buildings.

Committees were appointed as follows: Messrs. Dunwoody, Mell, and Upton, to prepare forms for records to be used by state services and volunteer observers; Messrs. Davis, Thomas, Mell, Dunwoody, and Woodruff, to report on a system of weather-signals for local display throughout the country; Messrs. Mendenhall, Fuertes, Dunwoody, Upton, and Payne, to consider plans for a permanent organization of the conference.

The attendance at the conference represented so many parts of the country, that its recommendations will doubtless have due weight in securing the desirable end of uniform methods of work in the state services now in operation, and in those yet to be formed. Among the members of the signal service, there were present Professor Mendenhall, Lieutenants Dunwoody, Woodruff, Finley, Walshe, and Day, Professors Ferrel, Abbe, Hazen, Russell, and Marvin, and Mr. McAdie. The state services were represented by Professor Thomas of Ohio, Professor Payne of Minnesota, Professor Young of Nevada, Professor Mell of Alabama, Messrs. Henderson and Redding of the bureau of agriculture, Georgia, Professors Upton and Davis and Messrs. Rotch and Ellsworth of New England, and Professor Huston of Indiana. Professor Fuertes of Cornell university, and Mr. Gillingham of Virginia, volunteer observers of the signal service, were also present.

The conference adjourned, to meet again at the call of the committee on permanent organization.

At the meeting of the committee on permanent organization, held after the adjournment of the conference, it was decided to organize under the name of the 'Association of local weather services,' and to hold meetings annually in February. The object of the association is to encourage and promote the mutual co-operation of the local weather services and the general weather service of the United States. Its membership is limited to the officers of local services or duly appointed delegates, together with representatives from the chief offices.

METHOD OF STATING RESULTS OF WATER-ANALYSES.

THE Chemical society of Washington, at the meeting of Nov. 12, 1885, appointed a committee to consider the present state of water-analyses, and to present a method of stating analyses adapted for general use, in order that those hereafter published may be readily compared with each other and with future work. This committee reported Feb. 11, 1886, and was authorized to prepare an abstract for publication, in order to call the attention of chemists to the subject.

The society earnestly recommends the adoption of the scheme which is herewith briefly presented. The full text of the report will be published in the next bulletin of the society.

Water-analyses are usually made to answer one of three questions: viz., 1°, Is the water useful medicinally? 2°, Is it injurious to health? and, 3°, Is it suitable for manufacturing purposes? Many books relating to water were published during the eighteenth century, but accurate chemical analysis was not attempted until about 1820. As the earlier analyses were isolated, rare, and made for special purposes, the form of the statement was of little importance, if it was only intelligible. At the present time, however, water-analyses are very numerous. An examination of about a thousand shows some forty-two methods of stating quantitative results, there being sometimes three different ratios in the report of one analysis. Such discrepancies render comparisons difficult and laborious.

The various methods of statement may be classified under the following general forms:—

1°. Grains per imperial gallon of 10 pounds, or 70,000 grains.

2°. Grains per U. S. or wine gallon of 58.372+ grains.

3°. Decimally, as parts per 100, 1,000, 100,000, or 1,000,000.

4°. As so many grams or milligrams per litre.

The last two would be identical if all waters had the same density; but as the densities of sea-water, mineral waters, etc., are much above that of pure water, it is plain that the third and fourth modes are not comparable.

The committee therefore unanimously recommends—

1°. That water-analyses be uniformly reported, according to the decimal system, in parts per million, or milligrams per kilogram, with the temperature stated, and that Clark's scale of degrees of hardness, and all other systems, be abandoned.

2°. That all analyses be stated in terms of the radicals found.

3°. That the constituent radicals be arranged in the order of the usual electro-chemical series, the positive radicals first.

4°. That the combination deemed most probable by the chemist should be stated in symbols as well as by name.

The abandonment of Clark's scale has been recommended by Wanklyn and Chapman; and the recommendation made by the committee does not involve the disuse of his method, but merely the bringing of it into accord with the decimal system,—the changing from grains per gallon to milligrams per kilogram.

The last conclusion (No. 4) was deemed desirable from the frequent confusion in the statement of the iron salts and of the carbon oxides.

The committee is unanimously of the opinion that analyses in the form recommended will prove quite as acceptable to boards of health and to the public in general, for whom such analyses are often made, as if presented in the mixed and irregular forms commonly adopted.

The committee also feels sure that the people in general are better able to form a definite idea of the character of a water from a report stated in parts per 100, parts per 1,000,000, etc., than from one expressed as grains per gallon, the latter being a ratio wholly unfamiliar to any but those in the medical or pharmaceutical professions.

A. C. Peale, M.D.
Wm. H. Seaman, M.D.
Chas. H. White, M.D.

PARIS LETTER.

Many interesting scientific events have lately attracted attention here. The limits of my present letter will not permit me to speak of them all, and I will therefore confine myself to the most important ones.

The appointment of Mr. Mathias Duval to the professorship of histology in the medical school is one that does not meet entire approval. Mr. Duval is certainly an able man, and one much liked by his students; but it cannot be said that he is well fitted for the task he has assumed. He is much more proficient in anatomy and physiology than in histology. It had been hoped that the faculty of medicine would appoint to this professorship an histologist of known reputation, such as Mr. Malassez. There will be, however, one good result of Mr. Duval's appointment: histology will undoubtedly be taught in a clear and precise manner, which had never been the case under C. Robin's instruction. Mr. Duval is an excellent *vulgarisateur*, and thoroughly understands teaching. His students will certainly learn histology much better than they have hitherto.

With this accession to the faculty, however, the resignation by Mr. Vulpian, of his appointment as *médecin des hôpitaux*, is much regretted by his pupils. His reasons are not very well known. It has been stated that he did so in order to devote more attention to his patients; but the truth is, he has not much practice, and the greater part of his time is given to laboratory work. He has recently been asked to accept the appointment as *secretaire perpétuel* of the Academy of sciences, in the event of Mr. Jamin's death (which occurred yesterday), and it may be that he has thus sought opportunity to devote himself to this very absorbing task by resigning his other arduous occupations.

Mr. Paul Bert took his departure from Paris for Tonquin yesterday evening. Monday last he made a speech at the meeting of the Academy of sciences, bidding adieu in rather pathetic tones. The academy, however, reciprocated neither his real or assumed feelings nor his speech. One cannot but wonder at the general approval of Mr. Bert's mission to Tonquin. He himself is overflowing with happiness. His friends are sure he will do well, and be of use in Tonquin. His enemies — and they are not few — are convinced that he will commit some great blunder, and kill himself politically. They, however, feel a great relief in the fact that they will be rid of him for some time. Everybody is satisfied, even the Academy of sciences, who listened to his last speech with much coldness, as though to impress upon him their lack of interest in politicians. It certainly is a strange and unusual occurrence, in France at least, for a scientific man to become a politician, though it must in justice be said that Mr. Bert is a man of much intelligence; and, should he fail, it will be due rather to his temper than to his lack of ability.

A new French scientific periodical, the *Archives Slaves de biologie*, has recently made its appearance. It is published by Messrs. Richet & Mendelssohn, and will be devoted to the more important scientific works that are published in Russian, Tcheque, and other kindred languages. It will comprise original communications in French, or translations from the Russian, with reviews of the latest works on biological sciences in general. The first number contains more than three hundred pages of large octavo size, including original memoirs by Fritsch, on recently discovered human crania; of Godlewski, on Pocta and Wierzejski on fossil and living sponges; of Danilewsky and Kowalewsky, on Nawalichin and Botkine; and of many others, on various medical and physiological subjects. The remaining pages are filled with reviews and critical notes on the recent biological work in the Russian and kindred languages, from such writers as Mendelssohn, de Varigny, Danysz, Halperine, and others. The project is certainly a very commendable one, to thus gather up in a single journal all the scientific work of a country; and in this particular case the idea is all the better, from the fact that Slavonic *savants* do not all write in the same language, and that their scientific papers are not commonly met with. It is very likely that the periodical will be successful, filling as it does such a useful field. The example of the

Archives Italiennes de biologie is certainly encouraging, and we doubt not that the present journal will be as favorably received.

The unveiling of Claude Bernard's statue, erected in front of the College de France, took place some days ago. The ceremony was attended by very few persons, owing to the inclemency of the weather. Addresses were made by Mr. Berthelot, Mr. Renan, Paul Bert, and Mr. Dastre. Mr. Renan is of a very humorous turn of mind, and has a way of causing amusement at the expense of others, — a way that is very pleasant when it does not concern one's self. Speaking of P. Bert as one of the pupils of Claude Bernard, he said that Mr. Bert would also have his statue, some day or other, near that of Bernard. Mr. Bert took this in all seriousness, and with much thankfulness, thinking that he certainly deserved this honor. All except himself, however, perceived the point of Mr. Renan's remarks. Jokes should not be too refined; otherwise they may miss their mark, as did the present one. The best addresses were those of P. Bert and Mr. Renan. That of Mr. Berthelot was rather long, and Mr. Dastre did not say any thing new or interesting.

A month or so ago I had the opportunity of seeing Mr. Chevreul at the meeting of the French academy, where Bertrand was pronouncing his *discours de réception*, which was answered by Pasteur. Mr. Chevreul is very well preserved, and does not appear as old as he really is. He had an inclination twice or thrice during the meeting to take a little nap, but he struggled successfully against it. One or two allusions to his old age, and to his long, fruitful career as a chemist, received much applause. A person who has known him well for a long time says that he is certainly not weaker in intellect than he was eight or ten years ago; but, contrary to the general fact that old people recollect better, events that have transpired during their youth than later ones, Mr. Chevreul speaks only of his experiments on colors, not caring to talk at all of his very important and useful discoveries on the *corps gras*, on soap, candles, etc., which he seems to forget. V.

Paris, Feb. 13.

NOTES AND NEWS.

MR. PASTEUR, according to a telegram to the New York *Herald*, read on Monday last a paper before the French academy of sciences, giving the results of his methods of treatment for hydrophobia. Three hundred and fifty persons have been treated, including twelve Americans, all of them successfully, except one, who was not brought to the laboratory till thirty-seven days after having been bitten. During the six years preceding 1885, in the department of the Seine, 517 persons had been bitten by mad dogs, from which there resulted 81 deaths, or about one out of every six bitten. It is proposed to open an international establishment at Paris for the inoculation treatment, and already funds are being largely subscribed.

— The dog by which the Newark children, who were sent to Paris for treatment, were bitten, was evidently not mad. The dog, it will be remembered, was killed at the time; but seven others which were bitten by it have been kept under the closest surveillance, and have shown no indications whatever of hydrophobia. They have been released.

— In our issue of Feb. 19, in mentioning Miss Crocker's 'Methods of teaching geography,' an unfortunate slip of the pen made us give Miss Hale the credit of its authorship. It was written by Miss Lucretia Crocker, and is in every way a most creditable piece of work.

— The 'Forum' (New York, *Forum publishing Co.*) is the title of a new monthly magazine, edited by Lorettus S. Metcalf, the former managing editor of the *North American review*. The magazine will address itself to the mass of intelligent people, and will discuss subjects that concern all classes alike, — in morals, in education, in government, in religion. The first number, for March, contains articles by Prof. Alexander Winchell (on Science and the state), James Parton, E. P. Whipple, Drs. R. H. Newton, E. E. Hale, A. Cleveland Coxe, W. A. Hammond, M. J. Savage, and Howard Crosby.

— A new polar expedition, says *Das Ausland*, under the leadership of Dr. Bunge and Baron Toll, has been organized for the zoölogical and topographical investigation of the islands of New Siberia. The expedition will reach its destination the coming spring.

— The American economic association held a business-meeting in New York, Feb. 27, President A. Walker in the chair. The next meeting will be next autumn, at a date not yet fixed upon.

— A bill limiting the hunting of deer or the sale of venison in the state of New York to the period between Aug. 15 and Nov. 1, has been passed by the assembly. The bill also prohibits the transportation of dead deer by railroad companies, except that the bodies of two deer killed by a sportsman may be taken to his home by him in the limited period stated.

— The *Naturwissenschaftliche rundschau* (Braunschweig, *Vieweg & Sohn*) is a new eight-paged

weekly periodical, devoted to the 'gesammtgebiete der naturwissenschaften.' The first numbers are mostly filled with abstracts and reviews.

— The London *Daily telegraph* states that an effort is at last being made to disinter the Sphinx. The work of exhumation is intrusted to Brugsch Bey, brother of the distinguished archeologist, who will carry out a plan formed by Signor Maspero. About 20,000 cubic metres of sand must be cleared away. To expedite this task a little tramway has been constructed, and 150 laborers are engaged for the more mechanical portion of the toil. About Easter the work is expected to be completed. Then, when the rock out of which the statue has been hewn is laid bare, a broad circular walk will be constructed around it, and a high wall built to guard against future encroachments of desert sands.

— A correspondent of the New York *Herald* says that it is very probable that Mr. Rousseau, who was sent by the French government to inspect the Panama canal, must report that the present enterprise is inevitably to be changed from a sea-level canal to a canal with locks, if it is ever to be finished by the present company, thereby not merely falsifying M. de Lesseps's assurances a hundred times reiterated, but also the very basis of the preference given to the Panama route over that of Nicaragua. Regular subscriptions to the funds are exhausted, and it is proposed to raise a hundred or more million dollars by a national lottery.

— It is expected that the Grecian canal, connecting the gulfs of Corinth and Aegina, will be completed by the end of the present year. The canal will be less than three miles in length, but the deepest cuttings are nearly two hundred and fifty feet in depth. The canal will admit the passage of the largest ships, and will shorten the sea distance between the Adriatic and the levant a hundred and thirty miles.

— In a recent paper the eminent French *savant*, Alphonse de Candolle, reproduces with approving comments the arguments of Prof. A. Graham Bell upon the production of a race of deaf-mutes in the United States. In commenting upon the methods proposed to prevent this result, he adds that the English language is the least favorable of all for spoken use among deaf-mutes, as the movements of the lips are more often replaced by an accentuation or intonation that does not produce any visible effect. The vowels are articulated less clearly than, and are not so sharply differentiated from each other as, in the other chief European languages. The French has very few words, such as *de* and *crac*, in which the lips do not take part in the pronunciation, while in English numerous sounds, as of *n*, *th*, and *h*, are formed almost wholly by the action of the tongue. This is confirmed by the experience of intelligent deaf-mutes. Mr. Candolle suggests, in addition to the views of Professor Bell, that, independently of deaf-mutism, marriage between first-cousins should be wholly prohibited. He also asks whether greater care given to new-born infants would not materially diminish the number of deaf persons.

— A new edition of 'Berghaus' physikalischer atlas' is announced, to be completed in twenty-five *lieferungen*, the first of which will appear about the middle of the present month. The work is prepared wholly anew, by the co-operation of Drs. Drude, Gerland, Hann, Hartlaub, Neumayer, and Zittel.

— The bird-destroying 'slung-shot' boy is not an eastern innovation. A writer in the Santa Barbara, Cal., *Press* deplores the evil that he has grown to be in the west, in the destruction of the native birds for millinery purposes.

— The following works are announced by the Smithsonian institution to be now in press: 'Scientific writings of Joseph Henry;' 'Flora of North America,' by Asa Gray; 'Guesde collections of antiquities,' by O. T. Mason; 'Annual report for 1884;' 'Paleontological bibliographies,' by J. B. Marcou; 'Bulletin of the Washington philosophical society,' vol. vii., for 1885; and the different reports of progress in 1885: viz., in chemistry, by H. C. Bolton; in geography, by J. K. Goodrich; in seismology and vulcanology, by C. G. Rockwood.

LETTERS TO THE EDITOR.

Oil on troubled waters.

One of the most curious things in connection with the use of oil on troubled waters is the frequency with which it appears as a new discovery. Those who would dismiss the subject with a contemptuous sneer at the credulity of people imposed upon by sailors' yarns know little of the prolonged attention the matter has received in the past, and of the honored scientific men who have studied the problem. There is no room here to quote the many observations at hand, but only to sum them up, and to present the explanation that has met with most favor.

The earliest reference at hand in English is found in Cavallo's 'Philosophy' (fourth American edition, 1879, p. 209). The author points out that oil spreads 'instantly' over water; that the wind has little effect in raising waves on the surface of oil, or of water covered with a film of oil; and that from early times this fact has been utilized in stilling the waves of the sea. The experiments of Franklin and others are cited.

In Gehler's 'Physikalisches wörterbuch' (Berlin,

1837, band vi. p. 1750 ff.) there is a good presentation of the subject, and many facts are cited. Most of them are drawn, however, from the thirty-page discussion in Weber's 'Wellenlehre' (1825). Here one finds quotations from Aristotle, Plutarch, and Pliny, which show that in early times the power of oil to quiet, and so render more transparent, the surface of water, was known. References are made to other and later writers, and to the facts collected by Franklin; and details are given of experiments made by him (Phil. trans., lxiv., 1774), and later by the Webers.

From all these data, as well as from the recent observations reported in *Science* (especially vii. p. 134), it seems that the effect of the oil-film is to diminish the 'combing' of the waves, and to prevent, in part at least, the formation of small waves, and the growth and sharpening of the crests of the large ones by the continued action of the wind. The exaggerated popular notion that the great waves are quieted seems to be erroneous. The only known ways of destroying in the open sea the energy of a wave once formed are by fluid friction, by rain, and by an opposing wind. But we must not underestimate the advantage of preventing the piling-up, on a wave already dangerously high, of another only a few inches high. On the well-known principle of superposition, it must sometimes happen that the crests of waves belonging to two or more systems will coincide. The resultant wave is then higher, and exposes more surface to the wind; and the crest, being sharper, is more easily blown off by the wind: so, as the wave is likely to run faster than the ship, it may break over her in a way that would not happen if it were only a little lower,—if only one of its smaller components could be suppressed.

It is further to be borne in mind, in seeking an explanation for the indisputable and useful effect of oil, that, as the passage of a wave is the transfer of energy but not of matter, the oil will not be carried onward by the wave; and that, if the formation of new waves over a given large surface could be prevented, the old ones would speedily pass out of it, and those coming into this surface from beyond would not be increased, but would decrease somewhat, because of the fluid friction.

The practical problem, therefore, before the shipmaster, is to find some means, 1°, of preventing the formation of new waves, or the growth of old ones, over a given surface to the windward of his ship, and, 2°, of making this surface as large as possible. He solves it more or less completely by the use of oil; and now we seek an explanation of the action of oil from the physicist.

The German physicists of the first part of this century followed pretty generally the view attributed originally to Aristotle, and elaborated by Franklin; the Webers subscribe to it; and Müncke, in 'Gehler,' says it is generally held: in a word, the friction of the wind is less on the oil than on the water. Stated in this way, however, the sentence is almost sure to convey a false impression. We know of absolutely no proof that this is true, if taken with its obvious meaning; but the truth it embodies is simply, that, owing to the interposition of the oil-film, the force of the wind is not communicated to the water; and this can be explained in a way consistent with modern physical notions. Franklin had pointed out how a ripple raised by the wind gets higher, broader, and longer at each successive vibration [and therefore travels faster]: he compares the effect of the wind to the setting of a heavy church-bell to swinging, by properly timed impulses of a finger. He thinks the adhesion between the oil and water is so slight (if, indeed, the repulsion be not strong enough to maintain the film at a small distance from the water) that the film can be moved a little by the wind without disturbing the water. He suggests, further, that the wind can 'catch' hold of the large wave better when this is covered with ripples, while, if it be oiled, the wind may press it down. The Webers add something with reference to the resolution of the force of the wind, which seems not quite sound in theory; and Müncke has something to say about a slight binding of the surface of the water by the oil.

But some properties of fluids unknown to the earlier physicists have a bearing on the present problem. Thus Daniell, in his 'Principles of physics' (p. 247), says, under the title 'Superficial viscosity,' "To the same cause [superficial tenacity] we must attribute the smoothing of the surface of a rough sea when oil is poured upon it: the new surface has great superficial tenacity and small superficial tension, and is not readily broken up into surf." The bearing of this may be shown thus. Imagine a perfectly calm lake: a wind strikes it, and it is covered with wavelets. It is not the increase of pressure over the lake that causes the waves, but slight differences of pressure between neighboring points, due to the fact that the winds flow more or less in gusts, not steadily. If the surface were solid, or very viscous, like mucilage or thick oil, the momentary force due to the difference of pressure would cease to act before any sensible movement could take place. The effect would be the same in kind, though differing in amount, however thin the film, or slightly viscous the oil may be; but we should remember that the superficial viscosity which is effective here is usually greater than the viscosity calculated from experiments where a considerable volume of the liquid is used. The effect, too, would be the same in kind, though the sea were rough instead of calm. We see, then, that an oil-film, by its viscosity (as well as by slipping over the water, if Franklin's view is correct), delays the action of the wind's force on the water for so long a time, that the force may have ceased to act before any movement begins, and then no work is done by the wind on the water. Thus, in an extreme case, no new waves are formed, and those driven on by the wind through the oil-covered surface do not have their crests continually elevated and sharpened till they are ready to break.

What might happen in an extreme case does happen, to some extent, in every case where oil is used on the water. Thus the wake of a ship generally shows a surface covered with bubbles more persistent than usual, and comparatively free from small waves, both effects being probably due to the traces of oil coming from bilge-water, the cook's galley, etc. Where a ship is driven before the wind, and the waves are running faster than the ship, if oil is being used, it is evident that the wind has to pass over a long oil-covered surface, and the effect of the oil will be especially favorable. Since it is essential to this explanation that the oil be spread to the windward, little benefit is to be expected from the use of oil on waves coming from a distant storm; nor when the wind is ahead, unless means can be used to throw the oil a long distance ahead.

If this explanation be correct, as we believe it to

be, there is no violation of the fundamental law of modern physics,—no destruction of energy.

The second practical problem is to cover as large a surface as possible with the viscous fluid. Fortunately this can be done easily in accordance with principles explained in many modern treatises on capillarity: for the surface tension of the film between water and air is so much greater than the sum of the tensions, oil-water and oil-air, that a drop of oil is very rapidly drawn out over an enormous surface. If this paper were not already so long, some numerical data might be given. The preference shown for animal or vegetable oils over mineral oils (*Science*, vii. 133) is probably justified by the smaller surface tension and greater viscosity of the former; though it may be noted, that, the greater the viscosity, the slower the oil will spread, other things remaining the same.

To render complete the explanation of this interesting and at first sight puzzling action of oil, experiments are needed by physicists in the laboratory, where for various oils the several physical properties above named shall be measured, and also experiments and observations at sea when wind and waves are moderate enough to be measured, and the captain may go in any desired direction without danger. A few days' observations, where the conditions can be controlled, would be worth hundreds of the desultory reports which the hydrographic office is wisely collecting.

Charles K. Wead.

Professor Thorell and the American Silurian scorpion.

Professor Thorell, who is perhaps the best authority upon the Scorpionidae, both recent and fossil, has rather severely taken to task some of my statements and determinations in connection with the recently discovered American Silurian scorpion (see *American naturalist* for March, 1886, p. 269). In fact, so sharp and pungent are some of his remarks, that a person reading them would naturally infer, that, in Professor Thorell's opinion, I was hardly capable of making a reliable observation, at least not upon a scorpion. He has shown his good nature, however, in the outstart, by admitting that the specimen is really a scorpion, and not a Eurypteroid, — a conclusion the exact contrary of that jumped to by one critic upon reading the first announcement of its discovery. For this concession Professor Thorell has my heartiest thanks. In his further criticisms, however, he is much less lenient, and I wish to briefly notice his objections in their order.

After making the above-mentioned admission, Professor Thorell proceeds to deal with the six ventral plates of this, what he calls, 'rather badly preserved fossil.' In my description in the American museum bulletin, I mention that the specimen is 'greatly compressed;' that the 'dorsal crust is preserved over about two-thirds of the surface,' mentioning the parts; and that "over the rest of the prae-abdomen and what remains of the post-abdomen or tail, parts of the first five segments, the inside of the ventral crust is exposed." This feature of the specimen has, I fear, misled Professor Thorell, and caused him to fall into an error, into which, if he had known the nature of the preservation of the fossils (Eurypteroids) found in the formations from which the scorpion was obtained, he probably would not have fallen. The specimen is greatly compressed vertically, as are all the fossils in the same rock. Along the left side of the abdomen there is a line of fracture, to the right of which the substance of the dorsal plates, and the filling between them, to the ventral plates below, has been removed in splitting the rock, and probably left on the other part. Along this line the thickness between the two sides of the fossil (dorsal and ventral) is about a twentieth of an inch or less. In speaking of this feature, Professor Thorell says, "The whole upper side of the abdomen is broken or cracked longitudinally," and that the articulations of the ventral parts are "all direct continuations of the articulations between the dorsals." Neither of these assertions is entirely true. The abdomen is partially removed, but not 'cracked' in the sense in which he uses the term; and the articulations between the joints of the ventral plates are not 'direct continuations' of those of the dorsal. Besides this, the overlapping of the plates show directly which is dorsal, and which is ventral; and no zoölogist would be apt to make the mistake. If we examine the abdomen of a beetle, roach, or scorpion, on the exterior, we find the anterior plates all overlapping those behind, both dorsally and ventrally: but, if we take off the crust and examine the inside, we find the reverse to be the case; that is, the anterior edge of the plates overlaps the one anterior to it. Now, this is precisely what is seen on this specimen: on the left side the anterior plates overlap those behind, while on the right side the posterior overlap those in front; and the surface of the plates is concave, while on the left side they are convex; so that a mistake is nearly impossible. Professor Thorell's statement, that, if his interpretation of this character is the right one, "the want of spiracles on the plates needs no further explanation," is therefore of no value, as he reasons from false premises: all his conclusions based upon his assumed features fall to the ground, and the want of spiracles is yet unexplained. There are six of these ventral plates plainly seen, extending from beneath the dorsals. Neither is the specimen a 'rather badly preserved fossil,' but instead an exceedingly well preserved and distinct one, as far as the parts existed when the specimen was embedded.

In a footnote to his observations on the above structure, Professor Thorell states, that, "even if the plates in question really were ventral plates, the first (or sixth when counted from behind forward) would seem, from its position, to correspond to the anterior half of the first ventral in the ordinary scorpions, and not to the small plate situated between the pectoral combs." On this statement I will make no comment, further than to say that I have failed to find, in the living species which I have examined, any case where the first (or anterior) ventral plate is even apparently articulated to the third ventral plate, or has the lateral width of this one.

Professor Thorell next goes on to say that "Mr. Whitfield thinks, that, whereas modern scorpions carry the tail (post-abdomen) arched upward over the back, Proscorpius, and also Palaeophonus, carried it in the opposite way, or curved downward." He says, "This would indeed be a character of fundamental importance for distinguishing the Silurion scorpions from all other members of the group," but that to him it is "impossible to find any stringent reason for adopting this strange hypothesis," and that it would cause "the animal's gait to be exceedingly difficult and awkward if it were to walk

with its tail curved under its body." I never intimated that it walked with its tail curved under its body; this is his own suggestion: but I cannot see why the animal might not walk with its tail straightened out behind, as well as to curve it over the back; in fact, the latter position seems much the more awkward of the two. As to stinging its prey after having caught it between the hands of its palpi, it might experience a little trouble: hence the necessity of the development of a more elevated feature by way of adaptation of parts to purposes. There must be a period in the life of a scorpion when the tail first assumes this elevated feature; for as Professor Thorell admits, just before birth in the living forms, the tail is curved downward. If the bend is downward then, when is it turned upward? and why, in these early forms, might not this embryonic feature be prolonged to a later or more advanced age Wasps and similar insects bend their bodies downward in stinging their prey, and are not particularly awkward, as I have often experienced. The ridges on the upper and lower surfaces of the tail-joints differ in all living scorpions which I have examined, and readily show which is dorsal, and which is ventral. Those seen on this specimen have the character of the ventral or lower side (inside as to curvature), and not "the same form and sculpture of the dorsal plates, or parts of these segments or joints in ordinary scorpions," as Professor Thorell wrongly asserts. They diverge at the anterior end, and converge at the posterior end. The very slight displacement of the tail segments is not sufficient to warrant the assumption that the entire tail has been turned over, although such may possibly be the case, but is not at all probable. I stated the fact of displacement in my description, and based my reasoning upon the improbability of its having been turned over. Of course, if it is turned over, my inferences are faulty. But has it been? I think not.

Professor Thorell next attacks the two poor little claws in the most pitiless manner, notwithstanding the animal has but one foot to show. This he holds out in the most appealing manner to the observer, entirely distinct, and free from interference by the other limbs, and with the two claws widely spread, as if in an effort to prevent disputation. Professor Thorell's remarks, in his effort to reason away one of these claws upon an assumption as to what a Silurian scorpion ought to be, partake so much of the character of 'special pleading,' that I do not feel called upon to make a very extended attempt at refutation. The specimen is so very distinct and positive in this respect, that I shall only say, in reply to Professor Thorell, that he can rest assured the specimen is not broken, or in any way mutilated in this part; that there are certainly two processes of almost equal size, the longer being only perceptibly narrower at its base, under a high magnification, than its mate; that the two processes are situated on the end of the joint behind, and not on the side of the end, in the position of a spine. Now, these processes he can call spines, or parts of a broken limb, or by any other name: they still remain claws to every appearance, are in the right position, and were undoubtedly used as such by the animal. In my examination of the specimen, I have made no assumption and manufactured no feature, simply taking the specimen as it is, without tinkering or dressing. I have had, in the matter of the double claw, the opinion, after examination, of many good observers, only one of whom failed to assert positively the existence of a double claw. That one exception, after a very cursory examination of only a very few minutes, gave no direct opinion.

After speaking of the transverse furrow across the base of the cephalothorax, Professor Thorell mentions '*the small size of the eyes*' as a feature in which this specimen differs from the Eoscorpionidae, and states that "in this particular it more resembles Dr. Hunter's and Mr. Peach's Scotch Paleophonus." I am not aware that the eyes of Dr. Hunter's and Mr. Peach's Scotch Palaeophonus have been actually observed so as to know their exact size. The specimen lies with the ventral side up, the eyes being embedded in the rock below, but, according to Mr. Peach, "are seen pressed up through the cuticle of the gullet," and would naturally appear somewhat larger than they really were in life, owing to the lifting of the cuticle over them. Consequently I do not see the force of the comparison.

Professor Thorell believes Proscorpius forms a 'good peculiar genus,' as "characterized by the somewhat trilobed anterior margin of the cephalothorax," — a feature which I should not consider as of more than specific value,—"and more especially by the shape of the fingers of the mandibles, which, if they really had such a form in the living animal as they, from Mr. Whitfield's figures, appear to have, differ materially from those of Palaeophonus and all other known scorpions." I am sorry Professor Thorell has not told us how they differ; then we should have had a basis of comparison. My figures of the mandible, three of which I gave, besides that in place on the enlarged figure in plate 19 (which, by the way, is not a drawing, but a print direct from a photograph of the specimen), were given to show the uncertainty of this part. They can be verified, however, by reference to that figure.

As to Professor Thorell's opinion of the systematic position and relation of this American fossil scorpion, which he has based upon a lack of knowledge of the specimen, and the assumption of characters and faults which it does not possess, I shall say nothing, as it rests entirely on the existence of a single or double claw. But as to his "additional reason to those given above for removing Proscorpius from the carboniferous Eoscorpionidae, and for referring this genus to the Apoxypodes, fam. Palaeophonidae," which he says "may be found in its being, geologically speaking, almost contemporary with the Palaeophoni," I should object to make geological position even an 'additional reason' for zoölogical classification.

Regarding the aquatic nature of the animal, there can be no certainty. The apparent total absence of stigmata, yet unexplained, leads one to inquire how they breathed, even if aquatic. The same may be asked of its aquatic associates in the rock, Eurypterus and Pterygotus, which show neither stigmata nor branchiae; but their aquatic character is not questioned. That it should be any thing so 'very strange,' that a connecting-link between a small and a large form, like the scorpion on the one hand, and the Pterygoti on the other, should be found in "such a little creature as the Proscorpius Osbornii," I think few will admit; nor are all the Eurypteri and Pterygoti so very 'gigantic' as his language would indicate.

R. P. WHITFIELD.

Amer. mus. nat. hist., New York City.

The language of the Bilhoola in British Columbia.

The Bilhoola tribe inhabits the district of Dean Inlet and Bentinok Arm, and is surrounded by tribes of the Kwakiool family. Their language, as those of the neighboring tribes, is very little known: therefore the following remarks, imperfect though they be, may be of interest. The material was collected by me from some individuals of this tribe who were brought to Germany by Capt. A. Jacobson, and staid for a fortnight at Berlin.

The most remarkable peculiarity of the language is, that words in connection cannot be expressed except by the help of certain prefixes much resembling an article. The most common of these are *ti* and *ua*. For instance: 'large,' *shg* (*sh* pronounced almost like *ch* in the German *ich*); 'stone,' *t'ht* (*h* like *ch* in the Scotch *loch*); 'large stone,' *ti shg ti t'ht*.

The plural of nouns is formed in different ways, either by reduplication of the initial sound or by the ending *uks*. In some instances I found *pi* and *tj*. Frequently the singular serves also for the plural. It seems that the cases are only expressed by the position of the word in the sentence.

The personal pronoun is—

SINGULAR.		PLURAL.	
1*st person*,	ens	1*st person*,	th 'mitl'
2*d* "	ino	2*d* "	th 'optl'
3*d* "	t 'aish	3*d* "	t 'auts

The possessive pronoun is formed in two ways: it is either derived from the personal pronoun, and connected with the noun by *ti* in the singular, and *ua* in the plural (for instance: *enstl 'ti t'nah*, 'my head;' *th 'mitl 'ua sotl'*, 'our house'), or it is expressed by a suffix (*t 'nah-stsh*, 'my head;' *sotl 'tlsh*, 'our house').

The flexion of the verb is quite remarkable. It is either formed by a personal pronoun and the stem of the verb, both being connected by *ti* or some other prefix, or by suffixes. Besides, the pronoun can be repeated after the verb: for example, —

ens ti tl 'ap
th 'apsts
th 'apsts ti ens } 'I go.'

The suffixes are identical with the possessive suffixes of the noun.

The objective flexion of the verb bears the features of having originated by agglutination of the pronoun to the verb; for example, *ksh'*, *sh sino*, 'I see you;' *ksh 'sh titl*,' 'We see them.'

I could not find any distinct traces of the tenses being expressed by suffixes or by prefixes. An iterative is formed by the prefix *atl'*; a locative, by *nu*.

The principal colors are red, yellow, and blue, the limit between the latter two being indefinite. Green is sometimes called yellow, sometimes blue; viz., similar to the one or the other.

The names of the numbers are formed according to the quinary-vigesimal system: 6 is 5 + 1; 11 is 10 + 1; 20, one man, i.e., the number of fingers and toes; 40, two men, etc.

The vocabulary bears only a very slight resemblance to that of the Kwakiool and the Selish. As far as I know, the grammar much resembles that of the Bilballa.

The traditions and customs of this people are almost identical with those of the Tlinkit and their other neighbors, though in their details there may be some differences.

FRANZ BOAS.

Berlin, Feb. 5.

Discomforts arising from sponge spicules in pond-soils.

Near Monticello, in this state, are numerous ponds and sloughs, many of which have been drained and brought under cultivation. The soil is of the typical humus character, containing no clay and but very little sand. For ages, perhaps, each summer has produced its rank growth of aquatic plants, and each autumn has laid this growth beneath the rippling surface of the pond, to be protected from thorough decomposition by its waters: consequently, when the hand of improvement removes the water, a rich bed of vegetable matter is brought to the sun and air. Such situations are peculiarly favorable for the cultivation of corn, and large yields may be produced; but in the cultivation of the crop a most annoying difficulty is encountered. In bright, warm days, the workmen in these fields experience a distressing itching in those parts of the body where there is rubbing or chafing of the boots or clothing. I cannot better describe this sensation than by comparing it with the pain occasioned by the attack of a flock of mosquitoes upon the affected parts. It is almost unbearable, and some persons are obliged to stop work and seek relief. Usually by taking a bath and cooling the body the irritation ceases; but, if it again be heated by over-exertion, the pain is renewed. Such a condition will last for about two days.

On microscopic examination, we found among the particles of sand and vegetable matter numerous spindle-shaped, sharp-pointed bodies. Some were hooked and curved; some broken in the middle, making one end blunt; some were covered thickly with spines. These have been identified as diatoms and fresh-water sponge spicules. The bodies are of a siliceous character, for they are not destroyed by ignition, nor attacked by hydrochloric acid. Since fresh-water sponges are quite abundant in many ponds, their remains form a conspicuous part of the soil.

Having thus ascertained the cause of the irritation, it is not difficult to understand its production. A fine impalpable dust always rises from the soil when it is being cultivated. This penetrates the clothing, and finds its way to those parts of the body where there is friction between the skin and clothing. The backward and forward motion of the cloth causes the spicules to work their way into the skin far enough to irritate the nerves and produce the pain. The increased circulation due to active exercise increases the sensitiveness of the skin, and hence the pain is greater under such conditions.

No remedy has as yet suggested itself. The best preventive is wearing such clothing as will most nearly exclude the dust. As the spicules are composed of one of the most enduring substances, they will not be removed from the soil by the usual changes taking place in it. Wind and cultivation may disseminate them so that they will be far less troublesome, but it will be a slow process. Altogether, the outlook for the comfortable cultivation of these pond-soils is not encouraging; and, if the large crops which they are capable of producing are obtained, much annoyance and inconvenience must be endured.

S. T. VIRDEN.

Purdue university, Lafayette, Ind., Feb. 20.

Preliminary description of a new species of Aplodontia (A. major sp. nov., 'California show'tl,' 'mountain beaver').

I have received from one of my collectors eight specimens of a new species of Aplodontia captured in the Sierra Nevada Mountains, in Placer county, Cal. It may be distinguished from the only previously known species of the family by the following diagnosis: —

Length, about 400 mm.; hind-foot with claws, about 60 mm.; height of ear, about 8 mm.— Pelage, comparatively coarse and harsh; hairs of flanks, elongated beyond those of the surrounding parts, forming on each side a more or less pronounced oval patch, from 60 to 80 mm. in length and from 40 to 60 mm. in breadth, which terminates abruptly about opposite the hip joint, and which is most marked in specimens not fully adult. *Color:* Whiskers, black; back, grizzled gravish-brown, the tint of the brown being that of a dilute bistre; hairs at base and under fur, very dark plumbeous: rump and belly, grizzled mouse-gray, sometimes faintly and superficially washed with very dilute brown; a distinct patch of white in the anal region; tip of nose, sooty-brown, which color sometimes extends backwards in a narrow stripe almost to a point midway between the eyes. *Cranial characters:* The skull is much larger and heavier than that of A. rufa, and the occipital crest is more highly developed; the zygomatic arches are more bowed outward; the nasal bones are broadest at or near their anterior ends instead of some distance posteriorly; and the ratio of the upper molar series of teeth to the basilar length is decidedly less than in A. rufa.

There are several other cranial differences which will be discussed at length, together with the animal's affinities with 'var. Californicus' of Peters, in a paper soon to be published.

C. HART MERRIAM.

International copyright.

While always an enthusiastic advocate of an international copyright as a matter of abstract justice to British authors, I have never been able to satisfy myself of the constitutional right of congress to enact a separate bill for the purpose of effecting one.

The constitution of the United States is a grant of power. Among other powers granted by it to congress is (art. I., sec. 8) that of promoting "the progress of science and useful arts by securing for limited times to authors and inventors the right to their respective writings and discoveries." This congress has already done. The question now presented is, therefore,

1. Has congress exhausted such powers under the constitution, and, if not, has it still power to legislate as to the degree of protection accorded authors and inventors, by enacting a statute to protect British authors, which statute (let it be admitted) will indirectly increase the profits of the American 'author and inventor'?

This question being disposed of, nothing further need be said as to the power; but a word might be added as to the merits of the question.

2. It is one of the legal necessities of our imperfect state that every individual, in selecting his vocation, assumes and subjects himself to the risks and dangers of that vocation; as, for example, an employee of a railroad company, other things being equal, cannot recover of the company for injuries received in the course of his legitimate employment by it. Now, the author, in selecting authorship as a vocation, accepts a risk which may, perhaps, be stated categorically; viz., while it is doubtless true that, 1°, an idea is property, it is equally true that, 2°, the form of words in which an idea is expressed is also property; but it is absolutely impossible to protect the idea when unclothed in words. The utmost the law can do is to protect the expression of the idea.

Now, the disability — the risk and danger of authorship which the author accepts — arises from the fact that it is possible to clothe an idea in any number of different forms of words. Let us suppose that A expresses an idea, absolutely original with himself, as follows: 'The sun gives warmth to the earth.' Let us suppose that B sees this in print, and steals it deliberately, putting it thus: 'The orb of day diffuses its heat over our planet.' It is evident enough that no statute or court can refuse protection to either or both A and B: for no court could try the question of priority of the abstract conception, and, even if it could, it could not protect that abstract conception separated from a statement of it in words; and B's statement is in words as well as A's. To obtain a patent, an oath and a contract are necessary. The applicant must first make oath to the originality of his invention, and, secondly, make a contract with the government; viz., that, on his part, he will fully and frankly state in his specifications the methods and processes by which he produces useful results, so plainly that anyone understanding the language could do the same, and that in exchange for these specifications, the government, on its part, will accord him a limited protection in the use of them for the inventor's sole profit. But the author of a poem, novel, or treatise, makes no oath of originality, and enters into no contract. He merely states the name and makes profert of his production; and the government takes notice, and shifts the burden of proof in his favor; that is to say, provides, that, if the author thereafter sue for an infringement, he need only plead his copyright, while it is for the defendant to attack.

It was this course of reasoning which led me, ten years ago (in a treatise on the laws of copyright), to say, that, unless there could be devised a law against paraphrase and plagiarism, copyright statutes were of very little practical importance, since a paraphrase of a work was fully as much entitled to copyright as the work itself. Is international legislation expedient to protect property so practically *publici juris*?

There is another phase of the question which I certainly do not care to press, but on which a consensus of opinion might be unfavorable to a statute of international copyright with England (though not, of course, with France, Germany, or other non-English speaking nations).

3. Is there any citizen of the United States, not at present a writer of poems, novels, or other literary matter, who would become one if there were an international copyright with England? Of course, if we can demonstrate that the divine call to write poems or novels is at present largely suppressed in our people by fears that they will be obliged to publish at their own expense, or that publishers will only pay them ten per cent; if it can be proved that this nation is suffering, and *in extremis*, for lack of

poems, romances, or general reading-matter, — it is the right and duty of congress, under the general urgency clauses of the constitution, to at once enact statutes for the public welfare and relief.

It has never been denied, I think, that, in times of great dearth or stress or suffering, extraordinary powers can be construed into that clause, for the general good of the whole people.

It seems to me, however, that there is no doubt possible but that congress would have power to simply amend its present copyright act by substituting the word 'person' for the words 'citizen of the United States,' which would at once give a perfect and absolute international copyright, and the best one possible; since any new and separate act would at once be brought before the courts for construction, whereas the word 'person' could hardly need judicial interpretation. This was the plan suggested by me in 1875, and I have seen no reason to depart from it since.

Appleton Morgan.

A recent ice-storm.

In answer to the question of Mr. W. M. Davis, printed on p. 190 of *Science* (vii. No. 160), I would suggest the following, deduced from observations of the effects of many similar storms, though the particular storm referred to, of Feb. 11–13, did not trouble the trees so much in this neighborhood as farther inland and farther north; for the temperature near Boston was not quite low enough to form much ice at that time.

Pine-trees make branches nearly at right angles with their trunks, and these branches become more and more pendant in their habit as they grow older. It follows, that, when an old tree is loaded down with ice, the branches can bend downward till they rest part of their weight on those below, and the lowest ones on the ground, without any abrupt bending at any one point. Moreover, pine wood, when alive, is quite tough, and will bear a good deal of distortion without fracture. The same reasons operate to protect our other coniferous trees of the spruce and fir tribes.

The white-oaks, although peculiar in retaining a good deal of their last year's foliage in winter, and carrying thereby a heavy load of ice on such occasions, have a prodigiously strong fibre, and, when alive, the branches possess great toughness. Anyone who has tried to break a small limb from a living white-oak tree knows that it is nearly impossible. The white-oaks of Worcester county, Mass., are famed for the hardness and toughness of their wood, which is fully twice as strong to resist fracture while green as that of the white-oaks of the western states, though probably similar to the same kind of oaks growing near the same latitude, and as near the sea in other states.

On the other hand, the maples, elms, ashes, beeches, and many other deciduous trees which abound in the district referred to by Mr. Davis, make branches that pursue an upward direction, and continue to bifurcate, as they grow upward, at small angles both with one another and with the parent stem or trunk; while their fibre lacks toughness, i.e., is easily split in most cases. When these upright branches bend downward with the load of ice, the mechanical problem is quite different from that existing in the pines and spruces: for, as the branches of these evergreens become more and more pendant, their centres of gravity, after getting below their point of origin, as they soon do, approach the trunk, and therefore exert less and less leverage the more they bend: while in the case of a beech, ash, maple, or elm tree, the centres of gravity of the upright branches depart from the vertical line of the trunk or point of bifurcation, and gain in leverage to effect fracture as they bend down, till they pass the horizontal; and then resistance to splitting is so feeble, that they often split at the fork before getting down as far as a horizontal position.

Among ornamental trees are some of peculiarly weak fibre which suffer extremely from ice-breakage. Such is the Virgilia lutea, of which I have some large specimens thus mutilated, though still very beautiful trees in June.

Edwd. S. Philbrick.

Brookline, Mass., March 1.

Habits of batrachians.

I have been unable to obtain information regarding the habits of the Amphiumidae of the United States,— Cryptobranchus or Menopoma, Amphiuma, Necturus, Siren, etc. (hellbenders, mudpuppies, etc.). Can any of the readers of *Science* tell where and when they are common, their larval habits, egg-laying habits and seasons, etc.?

George Baur.

Yale coll. museum, New Haven, Conn.

A tornado brood in Hampshire county, Mass.

I find some additional notes, made at the time, from which it appears that the storm resulting in the destruction of Northampton bridge, June 14, 1877, exhibited at first a whirl in the shape of a huge umbrella hanging from the main cloud, the convexity upward: its destructive career may therefore be interpreted as a tornado. I find, also, notes of a tornado at Westfield, July 9 of the same year. This was reported as coming down the gorge of the Westfield River, and thus confirms my view of the origin of the tornadoes I described (*Science*, Feb. 5) as having their point of departure over the Mill River branch-valley.

H. W. P.

'Marvels of animal life.'

In a notice of 'Marvels of animal life,' in *Science* of Jan. 1, your reviewer says, "It will surprise some readers to see man and the Pteranodon represented on plate 31 as contemporaneous." The human figure was introduced in the cut merely to give young people some idea of the size of the animal, and was intended to have no other significance, the omission of this explanation in the text being an oversight.

C. F. Holder.

Pasadena, Cal., Feb. 17.

The competition of convict labor.

In reading Mr. Langerfeld's letter in *Science* of Feb. 19, one point occurs to me. He finds fault with my arithmetic. Now, I made it clear in one of the earlier articles that the competing power of convicts was in this country only about sixty per cent of what their numerical strength would seem to give them. In my letter printed in your issue of Feb. 12, all this was taken for granted, as I was unwilling to cumber your space with a repetition.

Nicholas Murray Butler.

New York, Feb. 25.

Recent Proceedings of Societies.

Natural science association, Staten Island.

Feb. 13. — Mr. Hollick remarked upon the vegetable remains in the cretaceous fire-clay beds at Kreischerville. Specimens have been carefully studied and compared with others from New Jersey, with the result of confirming that the Kreischerville beds are but the extension of those at Woodbridge and Amboy, and were continuous with them until cut through in comparatively recent times by the channel of the Kills. The specimens were found in a narrow stratum, nowhere more than a foot in thickness, near the surface of the bed. The stratum was conspicuous from its dark color, due to the mass of lignified vegetable matter which it contained. Much of this was broken twigs and branches, some pieces being quite large, and showing the woody texture very beautifully; they, however, fell in pieces upon exposure to the air. Specimens of willows are found in almost every block of clay examined. There are two highly characteristic and distinct species, — one with a broad lanceolate outline, tapering to a somewhat acutish tip; and the other a long narrow species, of almost uniform width, terminating in a blunt tip. There are great numbers of small leaves, evidently belonging to shrubs, resembling very closely some of our Ericaceae, and one of the fruits discovered appears to be very much like a Vaccinium. Pine needles are distributed plentifully throughout, and in one specimen there is a sheath or bundle containing three needles. Another conifer which has left its marks is so close to Sequoia that it has been referred to that genus. There are also a number of fragments of parallel-veined leaves, which are probably grasses or sedges. There are also little masses of a yellow substance here and there, which appears to be a fossil gum or amber. —— Dr. Carroll called attention to the relation between the death-rate for various diseases and the seasons. The importance of the ground-water as a factor in malarial diseases was urged, and the necessity of lowering its level by suitable drainage wherever possible. The speaker considered soil-saturation as the principal source of malarial troubles on Staten Island, especially on the drift formation. —— Mr. Wright exhibited a large mass of small stones (about a hundred in all) attached to one another by the edible mussel (Mytilus edulis). —— Mr. Davis stated that he had been informed some time ago, by Mr. Matthew Taylor, that a colony of night herons nested on Staten Island. The speaker in person had visited the heronry; and, from information gathered, it appeared that the birds came to the locality about a dozen years ago, but as they have been persecuted by the Italian laborers, who eat their eggs in large numbers, it is doubtful if they will again return, only a few individuals having been seen this past summer. Some of the farmers in the neighborhood also collected their eggs, which, when beaten up, were fed to the cows. The nests are exceedingly numerous, and are built in a thickly wooded oak-swamp.

Academy of natural sciences, Philadelphia.

Feb. 23. — Dr. Leidy called attention to a specimen consisting of the posterior portion of a last upper molar tooth of the mastodon from Florida, which he had attributed to a new species under the name Mastodon floridanus. The specimen is of unusual interest from the circumstance that it apparently exhibits the result of caries, — a condition of which he had never previously observed an instance in extinct animals. The supposed caries appears as an irregular excavation immediately above the crown of the tooth, about four lines in depth. The surface of the cavity appears irregularly eroded. He also exhibited a specimen of the tusk of a huge extinct hog-like animal from Florida, which had been found mingled with the teeth of the mastodon before referred to. The specimen nearly accords in shape with the corresponding part of the tusk of the hog, but approximates in proportionate size that of the hippopotamus. The worn surface in the entire tooth has been about three inches long, and is an inch wide. Thin enamel invests the tooth: excepting on the posterior surface, it shows no trace of the fluting formed in the tusk of the hippopotamus, nor the strong external ridge of the peccary. No undoubted remains of either the hog or hippopotamus have as yet been found on this continent, the peccary appearing to be the American representative of those animals. The fossil was provisionally referred to a new genus under the name Eusyodon maximus. —— Mr. Thomas Meehan, at a former meeting, called attention to the fact that during the past winter, when the snow covered the ground, he had observed blackbirds eating freely of the berries of the poison ivy, Rhus radicans, apparently without injury, although he had evidence that the berries as well as the leaves of this plant are poisonous to other animals. —— Papers 'On the structure of Stromatopora and its allies,' by Dr. C. Rominger, and 'On the phenomena of reversed vision,' by Charles Morris, were presented for publication.

Publications received at Editor's Office, Feb. 22–27.

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Rammelsberg. Die chemische natur der mineralien. Berlin, *Habel*, 1886. 90 p. 8°. (New York, Stechert.)

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Wundt, W. Essays. Leipzig, *Engelmann*, 1885. 4+386 p. 8°. (New York, Stechert.)

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GEOLOGY. CHEMICAL, PHYSICAL, AND STRATIGRAPHICAL. By Joseph Prestwich, M.B., F.R.S., F.G.S. Correspondent of the Institute of France, Professor of geology in the University of Oxford. In two vols. Vol. 1.: Chemical and Physical. 8vo. $6.25. (Oxford University Press.) Macmillan & Co., Pubs., New York.

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